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IDENTIFIERS	*Food Poisoning

ABSTRACT

The programed text provides a single lesson, four-hour, correspondence subcourse on the prevention of food poisoning. It covers the following areas: a definition of food poisoning; chemical food poisoning; biological food poisoning; causes and prevention of trichinosis; six factors controlling bacteria growth; bacterial infection; prevention of staph food poisoning; botulism, perfringens, strep, and Salmonella food poisoning; and the causes and prevention of dysentery. The subcourse is of interest to personnel who are involved in, or anticipate involvement in, food service supervision or food handling. The self-teaching medium provides the student with all the information needed for completion of the course and provides spaces in the text for responding to questions. After studying the programed text, the student is expected to complete the lesson exercises provided. A student inquiry sheet and a student course evaluation form complete the document. (BP)

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This is a Single-Lesson Subcourse

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QM0348

PREVENTION OF FOOD POISONING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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QM0348
PREVENTION OF FOOD POISONING

SECTION I

INTRODUCTION

1. SCOPE. This subcourse covers chemical and biological food poisoning; the conditions under which bacteria grow; prevention of food poisoning; and the causes and prevention of dysentery and trichinosis.

2. APPLICABILITY. This subcourse is of interest to personnel who are involved in or anticipate involvement in the supervision or handling of subsistence items. This subcourse is of particular interest to food service specialists, food service sergeants, bakers, and food service supervisors. Successfully completed, this subcourse will provide the student with a working knowledge of food poisoning prevention. This knowledge, reinforced with additional training and on-the-job experience, will enable the student to take the necessary precautions to prevent food poisoning and to detect foods that have been poisoned.

3. COMPOSITION. This subcourse consists of one 4-hour lesson of correspondence instruction.

4. PROGRAM OF CONTINUING STUDY. Upon successful completion of this subcourse, it is recommended that you apply to take one of the following:

a. QM0339, Military Food Inspection.

b. QM0475, Storage of Subsistence.

SECTION II

ADMINISTRATIVE INSTRUCTIONS

5. MATERIALS CHECK. Check to make sure you have any study materials listed on the cover. If anything is missing, unreadable, or not in order, let us know right away. Use a Student Inquiry Sheet; we've bound one into the back of this booklet. Take a look at your lesson answer form. Is the subcourse number on the form the same as the number of this subcourse? If not, get the word to us, we'll have a correct answer form on its way as fast as we can. Don't forget to include your social security account number (student number), mailing address, and ZIP code when you write.

6. LESSON ORGANIZATION. This subcourse is organized into a single booklet containing materials needed to complete the subcourse. The booklet has all the information and material you need to complete the subcourse and consists of a lesson assignment, programed text, lesson exercises, and a student inquiry sheet.

7. PROGRAMED TEXT. The lesson is organized using a programed text. This is a self-teaching medium which provides the student with the opportunity for immediate learning. Space is provided in the text for recording responses to questions asked. These responses will not be graded by the School.

8. LESSON EXERCISES. Take the lesson exercises only after you have studied the programed text. Remember, your answers must be based on the programed text, not on personal experience or information from other sources.

a. If you are a Quartermaster School student, use the machine-process answer form for your answers to the lesson exercises. We know you want to receive credit for this subcourse, so be sure to send the completed form to the School for grading. Please don't tear, bend, or puncture this form; if you do, the grading machine will toss it back at us, ungraded.

b. If you are a student of another school, use the instructions and answer form provided by that school.

9. EVALUATING SUBCOURSE. You will find QMFL Form 990-1 (Student Evaluation of Subcourse) at the end of the lesson exercises. Before filling out this form, read the instructions at its top. After filling out the form, return it with your lesson answer form.

QM0348 Credit Hours: 4

LESSON ASSIGNMENT

LESSON 1	Prevention of Food Poisoning.
STUDY ASSIGNMENT	QM0348, Prevention of Food Poisoning.
SCOPE	Definition of food poisoning; chemical food poisoning; biological food poisoning; causes and prevention of trichinosis; six factors controlling bacteria growth; bacterial toxin; bacterial infection; prevention of staph, botulism, perfringens, strep, and salmonella food poisoning; causes and prevention of dysentery.
OBJECTIVES	As a result of this assignment, the student will be able to--

1. Define food poisoning.
2. List and explain the two types of food poisoning.
3. Differentiate between food poisoning caused by bacterial toxin and bacterial infection.
4. List and explain six factors controlling bacteria growth.
5. List procedures for prevention of food poisoning.
6. State causes of trichinosis and dysentery.
7. State procedures for prevention of dysentery and trichinosis.

PROGRAMED TEXT

This is a programed text designed to help you learn. Information is divided into small segments called frames. You will take part in the program by answering questions and filling in blanks.

Write your answers in this booklet. Writing each answer will help you remember the information. If you find that you have written an incorrect answer, mark through it and write the correct answer above it.

The procedure is to read frame 1, which appears at the top of page 1; write your answer, if one is called for; turn the page and check for the correct answer on the next page. Continue on to frame 2. When you have finished the top row of frames, turn back to page 1 and proceed with the bottom row. The frames are numbered consecutively.

When you have completed the program, answer the lesson exercises, which are based on the objectives for this lesson. Work the exercises in this booklet before transferring your answers to the card. Don't forget you may use the programed text to help you with the lesson exercises.

1. Each year approximately one million persons in the United States are stricken with food poisoning. Some of these illnesses may last only 24 hours; others will cause pain and discomfort to the victim for the rest of his life.

89. The organism which is responsible for botulism likes moderate temperatures and lives in the absence of oxygen; that is, it is an anaerobe.

2. Food poisoning can be a serious matter to any Army unit. Even a minor case can disable the unit to the extent that it fails to accomplish its mission.

As a food service supervisor or food handler, you can help to prevent food poisoning by preparing, serving, and handling food properly.

3. What is food poisoning?

Food poisoning is the sudden illness of a substantial number of people who have recently eaten the same specific food.

Food poisoning can always be traced to a _____ food.

oxygen

91. The botulism organism grows without oxygen, in containers of processed food that are not commercially sterilized.

specific

4. For an illness to be diagnosed food poisoning, a _____ _____ of people who have eaten a specific food must become ill about the same time.

92. Botulism bacteria grow without _____ in containers of processed foods that have not been commercially _____.

substantial)
or) number
large)

5. A family of four could have food poisoning after a picnic; but, if six men from a company became ill after the entire company ate the same food in the dining facility, their illness could not be _____ _____.

oxygen, sterilized

93. The toxin produced by these bacteria is one of the most powerful poisons known to man. Only one milligram of the toxin ($\frac{1}{28,000}$ of an ounce) is needed to cause death to 8,000 people.

In two separate cases, death was caused by testing one snap bean.

food poisoning

6. An illness of a substantial number of people who have eaten the same food is _____ _____.

94. Temperatures of 212° F and above may destroy the toxin that causes botulism. However, if it is suspected that a food might cause botulism, the food must always be destroyed.

food poisoning

7. The two types of food poisoning are chemical and biological.

FOOD POISONING

CHEMICAL	BIOLOGICAL

95. The presence of this toxin has been indicated by swollen containers of processed food, discoloration of food, and abnormal or strong odor. Therefore, no swollen containers of food will be opened and the food served unless the surgeon or veterinarian so directs.

8. There are two types of food poisoning: _____ and _____. Any case of food poisoning can be classified as one of these two types.

96. Cans of food which show swelling or leaking _____ be served without the approval of the surgeon or the veterinarian.
(can - cannot)

chemical, biological

9. Food poisoning caused by bacteria, plants, and animals is biological food poisoning.

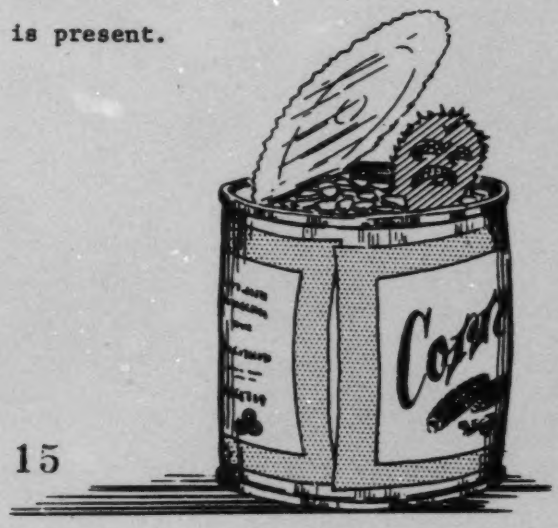
Food poisoning caused by insecticides, fungicides, and rodenticides and by the use of equipment that contains poisonous materials is chemical food poisoning.

FOOD POISONING

CHEMICAL	BIOLOGICAL		
	Plants	Animals	Bacteria

cannot

97. Food having unusual or off-odor or unusual or off-color must not be served or even tasted! Swollen containers may indicate that the toxin of the botulism bacteria is present.



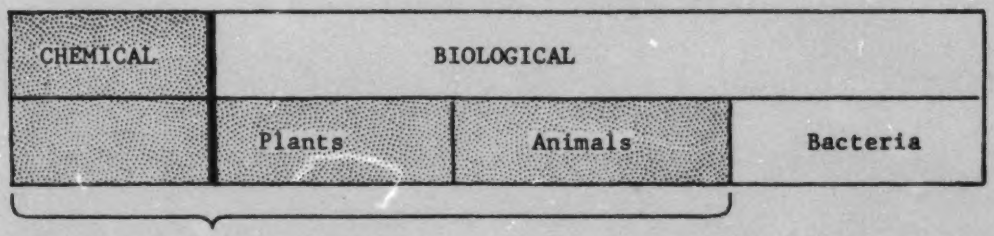
10. If food poisoning is caused by bacteria, animals, and plants, it is called _____ food poisoning.

98. If you open a can of corn and find that it has an unusual odor and color, do not _____ it or serve it.

biological

11. Chemical, plant, and animal food poisoning are the easiest to prevent. They account for less than 5 percent of all cases of food poisoning.

FOOD POISONING



Cause less than 5% of all cases of food poisoning.

---

taste

99. The presence of toxin from the botulism organism may be indicated in processed food by off-_____ and off-_____ or by _____ containers.

12. If chemicals, plants, and animals cause less than 5 percent of all food poisoning, then _____ cause more than 95 percent.

odor, color, swollen

100. You may not be able to tell by the color, odor, or taste of a food that the food is contaminated.

bacteria

13.

FOOD POISONING			
CHEMICAL	BIOLOGICAL		
	Plants	Animals	Bacteria*
antimony cadmium copper lead zinc insecticides fungicides rodenticides	some mushrooms rhubarb leaves water hemlock	some shellfish some tropical fish trichina	Staphylococcus C. botulinum Salmonella Streptococcus C. perfringens

* Staphylococcus food poisoning is usually called staph food poisoning. Streptococcus food poisoning is usually called strep food poisoning. This is the organism that causes strep throat. The terms "staph" and "strep" are used throughout this text.

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101. Some rules for the prevention of botulism are as follows:

--Do not serve or taste foods having off-_____ or off-_____.

--Do not serve or taste foods from _____ or leaking containers.

14. Certain metallic chemicals, if used in the manufacture of dining facility equipment, will cause food poisoning. Some of these are copper, lead, antimony, zinc, and cadmium.

---

color, odor, swollen

102. Some facts to remember about the botulism toxin are as follows:

--It is produced in containers of processed food that have not been commercially _____.

--It is a deadly _____.

15. Army Regulation 40-5 states that equipment which comes into contact with food will not be made of or plated with materials that contain cadmium, lead, zinc, or other poisonous material. However, galvanized metal may be used for storage of dry food.

The regulation also specifies that acid foods or beverages will not be stored, prepared, or served in zinc-galvanized containers.

sterilized, poison

103. Another toxin-producing bacterium that is more frequently being detected as a cause of food poisoning is the Clostridium perfringens (usually written C. perfringens). It is found in soil and in raw meat and is highly heat-resistant.

16. No standard Army dining facility equipment will contain a poisonous material.

Galvanized metal containers may be used for storing _____ _____ only.

104. It is _____ to kill C. perfringes with heat.
easy, difficult

dry food

17. The way to prevent food poisoning from metallic chemicals is to use _____ Army equipment in the preparation and storage of food.

difficult

105. Although the organism that causes perfringens poisoning is closely related to the one that causes botulism, perfringens is not fatal.

standard

18. Chemical food poisonings have increased with the general use of insecticides, fungicides, and rodenticides. These poisons are to be used only in the way prescribed by Army regulations (AR 420-76).

105. Perfringens poisoning develops in about 15 hours and lasts only a day or less than a day. The symptoms are abdominal pain, diarrhea, and chills. Not often does the victim experience nausea, vomiting, or fever.

If you heard that a patient had suddenly died of food poisoning, would you suspect perfringens or botulism? _____

19. Poisons cannot be stored in dining facilities. Poisons (insecticides, rodenticides, and the like) must be stored and used as prescribed by Army _____.

botulism

107. Meats that have not been carefully prepared are most often the cause of perfringens food poisoning. Meat pies, boned rolled beef roast, pork, turkey, and fish paste have all been incriminated. One outbreak of 2,000 cases was traced to stuffed turkeys.

Suppose you ate these foods for dinner: rolled beef roast cooked rare, creamed onions, carrots, and apple pie. You later were ill of food poisoning, which the doctor diagnosed as perfringens. Which food should first be examined for wholesomeness? _____

regulations

20. Two rules to remember in preventing chemical food poisoning:

Use only standard Army-procured mess equipment.

Follow Army _____ in the use of insecticides and rodenticides.

---

the roast beef

108. These are the conditions that increase the hazard of perfringens food poisoning:

--Improper processing of meats.

--Overhandling.

--Failure to refrigerate meats.

--Exposure of meat to air.

regulations

21. The three types of biological food poisoning are plant, animal, and bacterial.

Food poisoning from plants is particularly easy to avoid. No poisonous plants are procured for food; so it is necessary only to stay within supply channels and to use approved food sources.

109. To control C. perfringens, you must observe the following rules:

--Serve meat dishes as soon as they are cooked, or cool them rapidly to 40 to 45° F.

--When reheating foods, reheat rapidly to 145° F.

--Cook large cuts of meat thoroughly. (Use a meat thermometer to make sure meat reaches required temperature.)

--Divide stews and similar dishes into small lots for cooking and refrigeration.

22. If you use only plants obtained from approved sources or supply channels, you will not have food poisoning due to _____.

110. See if you can answer these questions:

a. Why should you divide stew into small lots for cooking or refrigerating? _____

_____

_____

b. Since C. perfringens are most often found in meats, where on the pH scale do they grow? _____

_____

plants

23. Using foods from approved supply sources is also important in preventing animal food poisoning. The Army carefully tests and inspects foods as they are purchased to make certain they can be safely eaten. It is unlikely, for example, that you would get animal food poisoning from fish or shellfish obtained from Army sources. (Remember, however, that these items and others can become contaminated with bacteria if not properly handled. They can then cause bacterial food poisoning.)

111. Answers to frame 110:

a. The food will heat or cool much more quickly, and the bacteria will not get a chance to grow. (or similar statement)

b. In the middle, or the netural area, of the pH scale.

24. The trichina, a worm so small that it can be seen only with a microscope, causes trichinosis, another type of animal food poisoning. A person may get trichinosis by eating trichina-infested pork that has been undercooked. Cooking pork to an internal temperature of 150° F and above will kill the trichina.

112. You have studied three types of food poisoning that are caused by bacterial toxins:

Staph food poisoning

Botulism

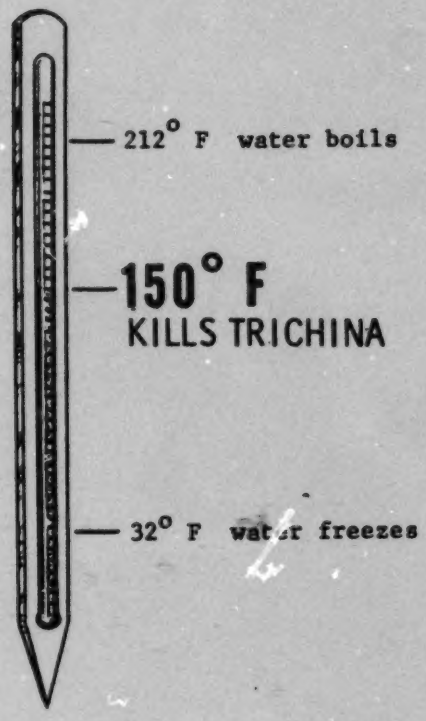
Perfringens

Now you will study two types of food poisoning that are caused by bacterial infection:

Salmonella food poisoning

Strep food poisoning

25. To prevent trichinosis, Army regulations require that pork be cooked to an internal temperature of 150° F.



113. Some bacteria produce food poisoning by causing infections. These may be the Salmonella bacteria. Many animals are carriers of Salmonella.

26. Pork must be cooked to an internal temperature of _____° F. to prevent _____.

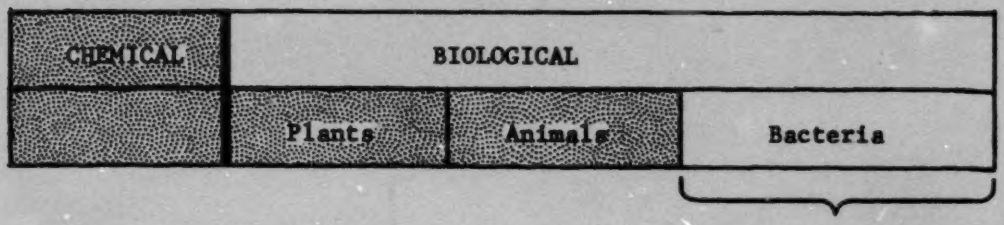
114. Salmonella are moderate-temperature-loving aerobes that must have a pH above 6 for growth.

They grow best in materials that are neither highly acid nor highly basic; for example: poultry, salads, meats, and egg products.

150, trichinosis

27. The three causes of biological food poisoning are animals, plants, and bacteria. However, bacteria cause 95 percent of all cases of food poisoning.

FOOD POISONING



115. Salmonella need _____ temperature. They live in an environment of _____.

28. Ninety-five percent of all cases of food poisoning are caused by _____.

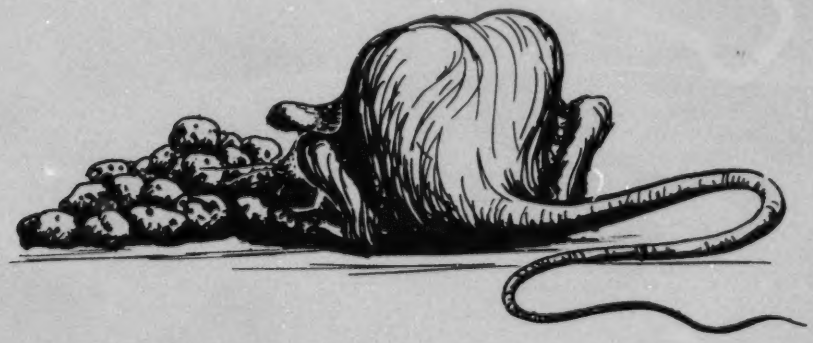
moderate, oxygen

116. There are many Salmonella organisms, and most of them will cause illness in man.

bacteria

29. Before studying the specific bacteria that cause food poisoning, you need to know what conditions promote the growth of bacteria. You can prevent the growth of bacteria if you understand how they grow and how you can control their environment.

117. Salmonella bacteria are common among cattle, swine, chickens, turkeys, dogs, cats, rodents, and man. Any one of these can be a carrier of Salmonella without becoming ill.



30. The growth of bacteria depends on six important factors. Use the memory word FOAMTT to help you remember these factors:

FOOD
OXYGEN
ACIDITY
MOISTURE
TEMPERATURE
TIME

118. Many of the animals that are known to carry Salmonella are used for food. However, Salmonella poisoning has been greatly reduced as a result of the U.S. Government's inspection of animals before slaughter and inspection of the carcasses.

Most of the other preventive measures are managed or controlled by dining facility personnel.

31. The first letter of the word FOAMTT stands for <u>food</u>. Bacteria, like all other living organisms, must have food. Many bacteria will feed upon the food of <u>man</u> and will grow freely in it.

<u>FOOD</u>
O
A
M
T
T

119. One way to prevent Salmonella poisoning is to <u>cook</u> foods <u>thoroughly</u>.

32. One reason that man is endangered by bacteria is that both man and bacteria live on the same _____.

120. Uncooked foods or foods prepared and contaminated by food handlers may be responsible for Salmonella food poisoning.

To prevent this kind of poisoning, cook foods _____.

food

33. The first important factor of bacterial growth is _____.

thoroughly

121. Salmonella food poisoning has often been referred to as a carrier illness; that is, it is spread by carriers of the bacteria. Any person who is a carrier must not be allowed to handle food.

What kind of examination do you think a person should have to determine whether he is a disease carrier?

_____

food

34. Another factor in bacterial growth is oxygen, or air. If you know the oxygen needs of the types of bacteria and can control the environment of bacteria, you can prevent bacterial food poisoning more easily.

Some bacteria live only in the presence of oxygen: Aerobes.

Some bacteria live only in the absence of oxygen: Anaerobes.

An answer like "medical examination" is satisfactory.

122. A food handler's examination is the type of medical examination given to determine whether a person who will handle food has a contagious disease.

35. Two of the six factors (FOAMTT) that influence the growth of bacteria are food and oxygen. Bacteria that live only in the presence of oxygen are called _____.
(aerobes - anaerobes)

123. Food handlers may be carriers of Salmonella. The type of examination given to screen out disease carriers is the _____ _____ examination.

aerobes

36. Aerobes are bacteria that live only in the _____ of oxygen.

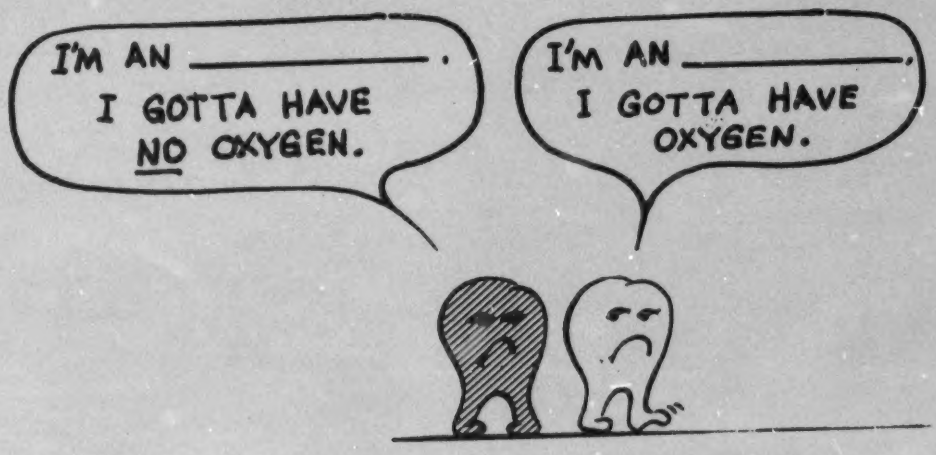
food handler's

124. Proper sanitation is essential in preventing food poisoning. Unclean personal habits, for example, failure to wash the hands after a visit to a restroom, are one way to contaminate foods.

Practice sanitation and good personal hygiene.

presence

37.



125. Good personal hygiene and proper _____ are important in the prevention of all food poisoning.

anaerobe, aerobe

38. Bacteria that live only in the absence of oxygen are called anaerobes.

sanitation

126. Keeping foods under refrigeration prevents the growth of Salmonella.

39. Aerobes live only in the presence of oxygen, but anaerobes live only in the absence of oxygen.

127. To prevent the growth of the Salmonella in foods, keep the foods under _____.

40. Because some bacteria can live where there is no oxygen, they can live in foods in sealed containers (for example, cans, bottles, and plastic bags or pouches). When they do, they contaminate the foods.

refrigeration

128. Rodents are well-known carriers of Salmonella. Foods must be protected from these carriers.

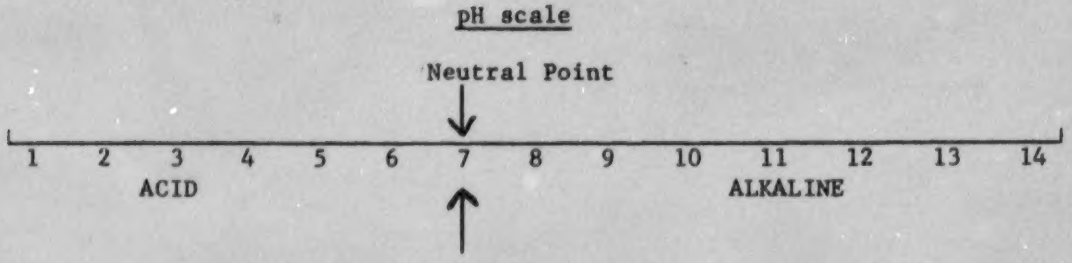
41. Two of the six factors that control the growth of bacteria are food and _____. The next factor you will study is acidity. Most bacteria grow best in materials that are neither strongly acid nor strongly alkaline.

FOOD
OXYGEN
ACIDITY
M
T
T

129. In your assignment in food service, you do not act as insect and rodent exterminator. You must report the presence of rodents and insects to the Post Engineer or the field sanitation team, depending on your situation. All large-scale insect and rodent problems are handled by the Post Engineer or the field sanitation team.

oxygen

42. The amount of acid or alkalinity contained in a material is measured on the pH scale. Most bacteria grow in the middle of the pH scale between pH 6 and pH 8.



130. Effective control and extermination of _____ and _____ are very important, because these vermin are known to be carriers of Salmonella.

The _____ _____ or the field sanitation team is responsible for large-scale extermination problems.

43. Many of the foods of man are neither highly acidic nor highly alkaline. Meats, for example, would fall in the middle of the pH scale, from pH 6 to pH 8. Most fruits contain a great deal of acid; most vegetables are alkaline. You can usually tell an acid food by its tart taste.

insects and rodents
Post Engineer

131. There are several practices that are effective in preventing Salmonella food poisoning.

--Keep foods under _____.

--Cook foods _____.

--Require food handlers to have a _____ _____ examination.

--Practice sanitation and good personal hygiene.

--Make certain that insects and _____ are controlled.

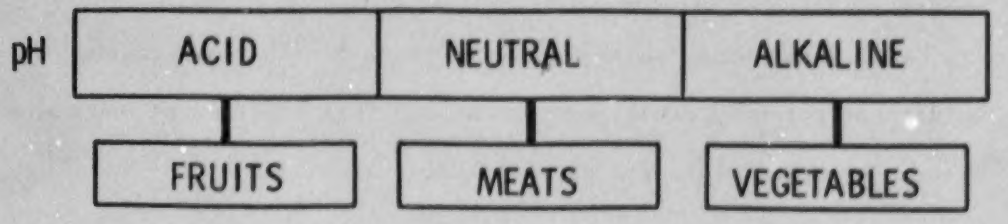
44. Some bacteria grow in highly acidic materials; others grow in highly alkaline materials. However, most bacteria grow best near the _____ of the _____ scale, from pH 6 to pH 8.

refrigeration, thoroughly, food handler's, rodents

132. Like Salmonella poisoning, strep food poisoning is caused by bacterial infection. You will recall that the strep bacteria are responsible for strep throat.

middle, pH

45. Here's where the classes of foods usually fall on the pH scale.



See if you can tell where each of the following foods would fall. In the blanks provided, write A beside an acid food, N beside a neutral, and Al beside an alkaline.

___ 1. grapefruit juice

___ 2. squash

___ 3. apples

___ 4. turkey

___ 5. peas

___ 6. steak

133. Strep food poisoning and Salmonella food poisoning are caused by bacterial _____. Infection is the harmful activity of bacteria as they multiply in the body tissues.

1. A 4. N
2. A1 5. A1
3. A 6. N

46. Since bacteria grow best in materials that are neither strongly acidic nor strongly alkaline, you can see that the food of man may be a natural breeding place for harmful bacteria.

infection

134.

CAUSED BY BACTERIAL INFECTION	CAUSED BY BACTERIAL TOXINS
Strep food poisoning	Staph food poisoning
Salmonella food poisoning	Botulism
	Perfringens

47. Three of the six factors that influence bacterial growth are _____, _____, and _____.

135. The strep organisms are aerobes.

They like moderate temperature, and they grow well in an environment having oxygen.

food, oxygen, and acidity

46. A fourth factor in bacterial growth is <u>moisture</u>. Because bacteria must absorb their food through their cell walls, they must have _____ to live and grow.

Food
Oxygen
Acidity
<u>Moisture</u>
T
T

---

136. Strep grow best in _____ temperatures. They also grow best in an environment of _____.

The Strep organisms, which have a pH requirement of less than 9.5, will not grow in material that is highly _____.

moisture

49. Moisture is so important that bacteria will not grow in a material in which the moisture content is lower than 15 percent.

If the _____ content of a material is less than 15 percent, bacteria will not grow in it.

moderate, oxygen, basic

137. Staph food poisoning is caused by bacterial toxins, but strep food poisoning is caused by bacterial _____.

Strep food poisoning is the least severe of the five food poisonings that you have studied. It lasts only 24 hours.

moisture

50. The first four factors that influence bacterial growth are _____, _____, _____, and _____.

F
O
A
M
T
T

infection

138. Some of the contaminated foods that have caused strep food poisoning are meat and poultry dressings, cheese, cream pies, croquettes, fried eggs, and meats. These aren't the only foods that could be contaminated with strep; so it's not necessary for you to memorize this list of foods.

Food, Oxygen, Acidity, and Moisture

51. Another factor in bacterial growth is temperature.

For bacteria to grow, they must have a suitable temperature.

Therefore, bacterial growth can be controlled by controlling

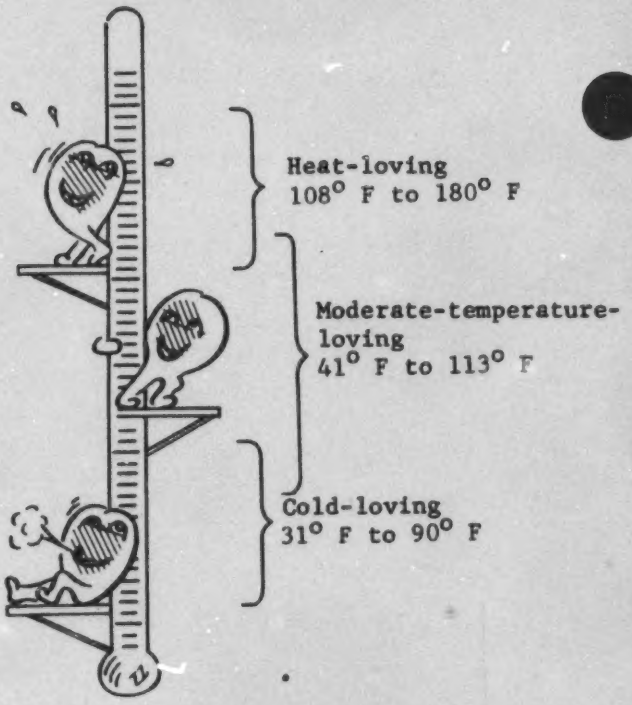
the _____.

Food
Oxygen
Acidity
Moisture
Temperature
T

139. The rules for the prevention of strep food poisoning begin with "Cook Foods Thoroughly." Sufficiently high temperatures will destroy strep organisms.

temperature

52. Bacteria may be divided into three groups with respect to temperature. The temperatures at which these bacteria grow best are shown on this thermometer.



140. To prevent strep food poisoning, cook foods _____.

"Refrigerate all foods" is also an important rule for the prevention of this type of food poisoning.

53. Bacteria are _____-loving, _____-temperature-loving or _____-loving.

thoroughly

141. The growth of the bacteria that cause strep food poisoning can be controlled by keeping foods under _____.

heat, moderate, cold

54. In addition to the three types of bacteria you have studied, there are others called heat-withstanding bacteria.

Heat-withstanding bacteria are highly heat-resistant; their spores (survival forms) can withstand boiling.

refrigeration

142. Some of the other rules for the prevention of strep food poisoning are similar to rules you learned earlier:

Avoid overhandling food, because the more the food is _____, the greater the risk of contamination.

Practice proper sanitation and good personal hygiene.

55. So far, you have learned five of the six factors that affect the growth of bacteria. They are

F_____

O_____

A_____

M_____

T_____

T

handled

143. Strep food poisoning is caused by bacterial _____. Prevention of this illness involves

--practicing _____ and personal hygiene.

--keeping foods under _____.

--cooking foods _____.

--keeping foods from being over _____.

Food, Oxygen, Acidity, Moisture, Temperature

56. Time also is an important influence on the growth of bacteria.

Given enough time, most bacteria can adjust to different foods, to an environment with or without oxygen, to varying degrees of acidity and moisture, and to different temperatures.

Food
Oxygen
Acidity
Moisture
Temperature
Time

infection, sanitation, refrigeration, thoroughly, handled

144.

Staph food poisoning)	Food poisoning caused by toxins
Botulism)	
Perfringens)	
Strep food poisoning)	Food poisonings caused by bacterial infections
Salmonella food poisoning)	
DYSENTERY:	A food-borne illness, not a food poisoning

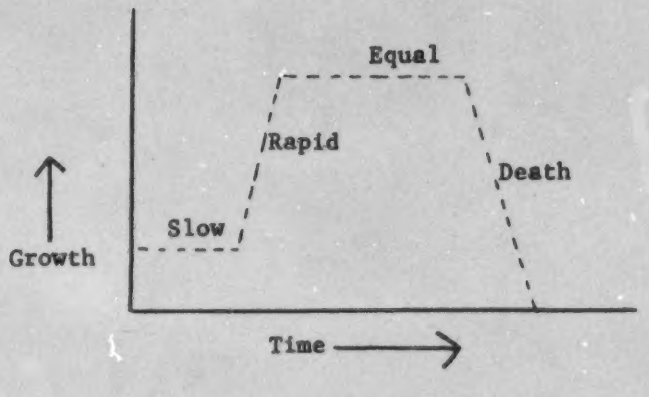
57. The time required for the growth and death of bacteria may be divided into four phases:

Lag (slow) phase

Rapid-growth phase

Equal phase

Death phase



145. Dysentery is a food-borne illness, not a food poisoning. A symptom of dysentery is diarrhea.

58. The slow phase occurs when bacteria are adjusting to a new environment. The growth rate during this period is very slow, because bacteria require time to make an adjustment to a new environment.

146. In many parts of the world, dysentery is more prevalent than the common cold. Usually this is true of countries that use night soil (human feces) for fertilizer. Surface water, man, unsterilized utensils, cockroaches, flies, and rodents act as carriers and contaminate food.

59. It takes _____ for bacteria to adjust to a new environment. Then they begin to multiply rapidly. In this period of rapid growth, the number of bacteria increases tenfold for every unit of time.

147. A dining facility that observes proper sanitary procedures will prevent dysentery from carriers, unsterilized utensils, insects, rodents, and locally procured foods that are eaten fresh.

Notice, however, that water and utensils used by the individual soldier were not included as a responsibility of the dining facility.

time

60. Bacteria require time to adjust to a new environment before they enter a period of extremely _____ growth.

Growth gradually levels off and remains constant for a few hours. During this time, growth of new bacteria equals death of old bacteria (the equal phase). Then the mass of bacteria begins competing for food, and there is more bacterial waste than food. Gradually, the bacteria die (death phase).

148. One of the primary sources of dysentery among U.S. troops is improperly cleaned (or dirty) messkits.

Other sources are unapproved water supply and contaminated uncooked fruits and vegetables.

rapid

61. The most important thing to remember about the time required for bacterial growth is that most bacteria can adjust to a new environment in about 4 hours.

Prepared food cannot be removed from the refrigerator and left at room temperature for more than _____ hours, because harmful bacteria will begin to multiply in it.

149. Sources of dysentery among U.S. troops are _____ _____ messkits, unapproved water supply, uncooked fruits and vegetables.

62. Most frequently, food poisoning is caused by <u>bacteria</u>, so that preventing food poisoning depends largely on preventing the growth of harmful bacteria. Six factors that control the growth of bacteria are

F _____

O _____

A _____

M _____

T _____

T _____

improperly cleaned, or dirty

150. The sources of dysentery are _____ fruits and vegetables, _____ water supply, and unsterilized _____.

Food, Oxygen, Acidity, Moisture, Temperature, Time

63. Bacteria cause illness in two ways:

By producing in the food toxins, or poisons, which when eaten cause violent stomach reactions.

By invading the body tissues and multiplying, producing harmful activity known as infection.

contaminated or uncooked, unapproved, messkits

151. Each soldier is responsible for his own messkit, but the field kitchen furnishes the water and facilities for cleaning it after use.

64. Toxins, or poisons produced by bacteria, may be present in food before it is eaten. Food poisoning can be caused by toxins.

The harmful activity of bacteria as they invade the body tissues and multiply is _____.

152. Regulations require that in a field kitchen situation the two messkit rinse waters be kept boiling while in use.

infection

65. Infection is the harmful activity of _____ as they multiply in the body tissues. The poisonous by-products of bacteria, or _____, also cause illness.

153. The way to sterilize messkits is to keep the water _____ in the two rinses.

bacteria, toxins

66. The toxins of some bacteria (staph food poisoning, for example) are heat-stable; that is, they are not readily destroyed by heat.

Even though leftover food is boiled before it is served, the _____ will still be present to cause food poisoning.

boiling

154. In the prevention of dysentery, it is important that messkits be _____.

toxin

67. Staph food poisoning, botulism, and perfringens food poisoning are caused by bacterial toxins.

properly cleaned

155. Another method of preventing dysentery is to use only approved water--both for drinking and for washing.

68. Although both staph food poisoning and botulism are caused by bacterial _____, they are not similar in other respects.

Staph food poisoning produces a toxin that _____ (is, is not) easily destroyed by heat.

The botulism toxin _____ _____ (can be, cannot be) destroyed by heat.

156. In an emergency--even in a combat situation--you will be given disinfectant tablets with which to make water acceptable for use.

toxins
is not, can be

69. Staph food poisoning produces illness for about 48 hours.

Botulism does not occur frequently in the United States; however, it is fatal to more than half of its victims.

157. In an emergency, _____

are used to make water acceptable for use.

70. Most cases of food poisoning are caused by the _____ that are produced by bacteria.

disinfectant tablets

158. When disinfectant tablets have been added to water, the water becomes approved for use. However, a more desirable situation is for the Engineers to provide water which has been approved by the medical authorities.

toxins

71. To prevent staph food poisoning, you need to know the conditions that promote the growth of the bacteria which cause it.

159. Fresh fruits and vegetables grown in areas where dysentery is prevalent must not be eaten raw except on the approval of the surgeon.

72. These bacteria like moderate temperatures, and they require oxygen for proper growth and development. They grow and produce their poisonous byproducts (toxins) best in materials that are neither highly acidic nor highly basic.

160. Raw vegetables or fruits from areas where dysentery is prevalent may be eaten only if they are peeled, thoroughly washed in water from an approved source, immersed in water at 160° F for 1 minute, or immersed in a prescribed chlorine solution for 30 minutes (AR 40-5).

73. The bacteria that cause staph food poisoning grow in _____ temperatures in the presence of oxygen. Their ideal environment is the neutral area of the pH scale.

161. In areas of the world where dysentery is prevalent, eating raw fruits or vegetables can be a health hazard. These fruits and vegetables must be cleaned as prescribed in Army regulations before they can be eaten.

moddrate

74. Boiling at 212° F for 30 minutes destroys the organism responsible for common food poisoning. However, the toxin produced by these organisms is very difficult to destroy. For this reason, the toxin is described as heat-stable.

Although the organisms themselves are destroyed, the _____ produced can still cause illness.

162. Raw fruits and vegetables grown in parts of the world where dysentery is common can be eaten only after they have been cleaned. The type of cleaning required is specified in Army _____.

toxin

75. Because of the danger from toxins, Army regulations prescribe that certain foods may not be retained as leftovers.

The usual heating of leftovers _____ destroy
(will - will not)
toxin produced in staph food poisoning.

regulations

163. In the frames that follow, you will briefly review some of the important points of this text. If you have any trouble remembering the answers, return to the appropriate portions of the text and review the material until you understand it thoroughly.

will not

76. Bacteria responsible for staph food poisoning seem to prefer ready-to-serve foods--custards and cream-filled pastries, hams, cakes, mayonnaise, chicken gravy, dairy products, and sausage.

But it is pointless for you to spend time learning long lists of foods in which the species will grow. Bacteria are highly adaptive. Given enough time, they can adjust to a new environment and to foods in which they don't usually grow.

---

164. Food poisoning is the sudden _____ of a _____ number of people who have recently eaten a specific food. (Frames 3-6.)

The two principal types of food poisoning are _____ and _____. (Frames 7-9.)

77. Refrigeration greatly reduces the possibility of growth of bacteria.

Experiments have shown that cultures of staphylococcus organisms refrigerated at 38° to 44° F required 4 weeks to produce toxins. Identical cultures kept at room temperature produced toxins in a matter of hours.

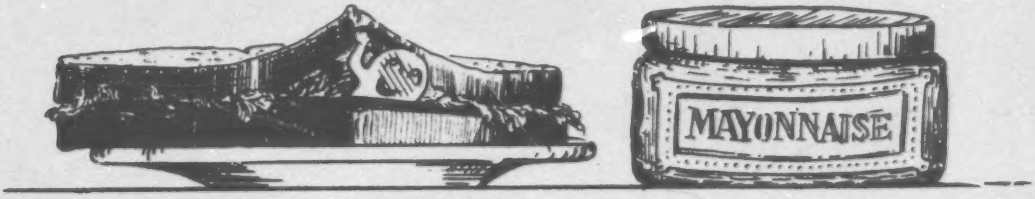
illness, substantial, chemical, biological

165. Plants, animals, and _____ are the three causes of biological food poisoning. (Frames 9., 10.) Of these three, _____ cause 95 percent of all cases of food poisoning. (Frames 27, 28.)

Trichinosis is a form of biological food poisoning that comes from eating _____ that has not been fully cooked. If the meat is cooked to an internal temperature of _____° F, the trichina will be killed. (Frames 24-26.)

78. All foods that will grow bacteria must be kept under _____. Some of these foods are pastry-filled bakery products, sandwiches, and cakes.

Sandwiches are often responsible for food poisoning. For this reason, sandwich fillers that readily support bacterial growth must not be used for box lunches; and prepared sandwiches must not be left at room temperature for more than 3 hours.



bacteria, bacteria, pork, 150

166. The growth of bacteria depends on six important factors (FOAMTT): _____, _____, _____, _____, _____, and _____. (Frames 30-62.)

Most bacteria can adjust to a new environment (to room temperature, for example) in about _____ hours. (Frames 58-61.) Foods that readily grow bacteria must be kept under _____. (Frames 77-80.)

refrigeration

79. Certain types of sandwich fillers are the ideal breeding places of harmful bacteria.

Prepared sandwiches must not be left at room temperature for more than _____ hours.

Food, Oxygen, Acid, Moisture, Temperature, Time, 4, refrigeration

167. Bacteria can cause illness by invading the body tissues and multiplying. This harmful activity is known as _____. (Frame 63.)

Bacteria can also cause illness through the production of _____. (Frame 63.)

3

80. Foods must be refrigerated properly so that they will cool rapidly. If a 10-gallon pot full of hot stew is placed in the refrigerator, it will take hours for the internal temperature of the stew to reach a temperature of 34° to 44° F. To refrigerate foods properly, place them in shallow or small containers.

infection, toxins

168. Three types of biological food poisoning caused by bacterial toxins are _____ food poisoning, _____, and _____. (Frame 112.)

Two types of biological food poisoning caused by bacterial infection are _____ food poisoning and _____ food poisoning. (Frame 112.)

81. Good personal hygiene is essential in preventing contamination by bacteria.

Bacteria are found on the skin; in boils, pimples, nasal discharges, and saliva; and in the air. In fact, each sneeze and cough discharges these organisms. If these bacteria contaminate food and produce toxins, food poisoning will result.

staph, botulism, perfringens, strep, salmonella

169. The toxin produced by the organism causing staph food poisoning is _____ (not readily destroyed by heat). (Frame 74.)

82. The fact that bacteria may be found in <u>any</u> <u>infection</u> has an important bearing on food handling.

If you were a supervisor and a cook came to work with sores on his hands, what should you do? _____

_____

_____

heat-stable

170. The most <u>deadly</u> food poisoning is caused by toxin and is known as _____. (Frame 88.)

An answer similar to "Keep him from handling food" or "Send him on sick call" is satisfactory.

83. If a person with an infection handles food, he may contaminate it with _____.

botulism

171. Some of the practices that will prevent salmonella food poisoning are as follows:

--Require _____ _____ examination.

--Keep foods under _____.

--Control insects and _____.

--Cook foods _____.

--Practice proper _____ and personal hygiene.

(Frames 119-131.)

bacteria

84. A case of staph food poisoning was traced to meat and gravy prepared by a cook whose fingers had become infected after having been burned.

Persons with _____ must not be allowed to handle foods.

food handler's, refrigeration, rodents, thoroughly, sanitation

172. Some of the practices that will prevent strep food poisoning are:

Keep _____ _____ to a minimum.

Cook foods _____.

Keep foods under _____.

Practice proper _____.

(Frames 139-143.)

infections or burns

85. The more food is handled, the greater the possibility of contamination.

One way to keep food from being contaminated is to keep food _____ to a minimum.

food handling, thoroughly, refrigeration, sanitation

173. The toxin that causes botulism is produced in containers of processed foods that have not been commercially _____. Food from leaking or _____ containers or food that has an off-color or off-odor may contain the botulism toxin. (Frames 91-95.)

handling

86. Some rules for the prevention of staph food poisoning are as follows:

--Keep food handling to a _____.

--Keep all foods that will grow bacteria under _____.

--See that persons who handle food are free of infections and that they practice good personal hygiene.

sterilized, swollen

174. The most frequent source of _____ food poisoning is improperly prepared meat.

The best way to control it is to serve meat dishes as soon as they are cooked or to _____.

minimum, refrigeration

87. Botulism, like staph food poisoning, is caused by toxins, which are produced by the organism Clostridium botulinum.

perfringens, cool them rapidly

175. The sources of dysentery are improperly cleaned _____, unapproved _____ supply, and uncooked _____ and vegetables. (Frame 150.)

88. Botulism is most often fatal.

(Return to page 1 and continue with frame 89.)

Answer to Frame 175

messkits, water, fruits

APPENDIX
FACT SHEET

Requirements for Bacterial Growth

FOOD — Essentially all foods fit for human consumption are food for bacteria.

OXYGEN — AEROBES require oxygen
- Obligate aerobes must have oxygen
- Facultative aerobes may adjust to no oxygen

ANAEROBES grow without oxygen
- Obligate anaerobes cannot grow in oxygen
- Facultative anaerobes can adjust to grow with oxygen

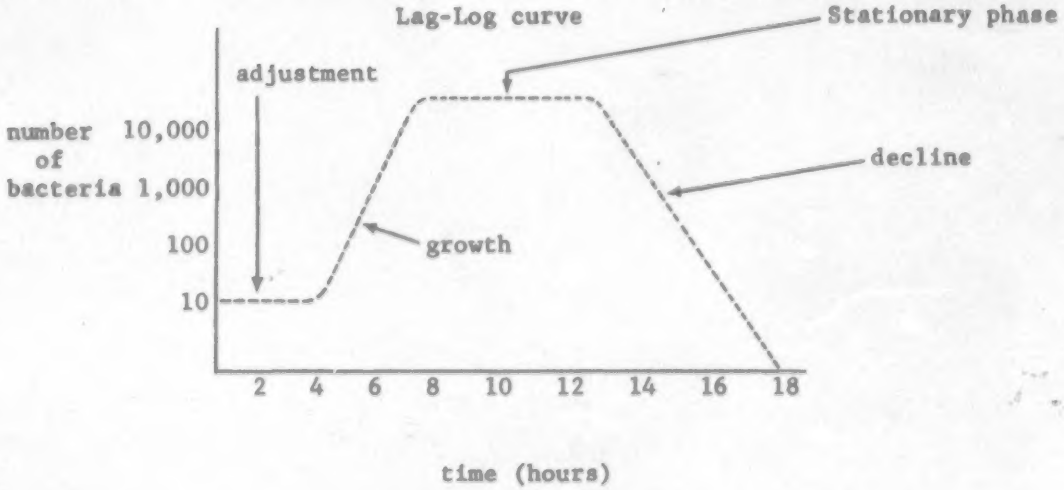
ACID — Most bacteria grow in a relatively neutral material; which is neither strong acid nor strong alkaline. Acidity and alkalinity are measured on the pH scale.

	Acid					Neutral					Alkaline			
pH scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	← ACID →							← ALKALINE →						

MOISTURE — Bacteria receive food through their cell walls and cannot grow when the moisture is less than 15 percent.

TEMPERATURE — Bacteria are classified as follows:
Psychrophilic--cold-loving
Mesophilic--moderate-temperature-loving
Thermophilic--heat-loving
Thermoduric--heat-resistant

TIME — Food left open at room temperature can cause food poisoning because of the Lag-Log curve characteristic of "food spoilers."



QM0348

CORRESPONDENCE SUBCOURSE LESSON EXERCISES

WAIT

DO NOT GO ON TO THE LESSON EXERCISES UNTIL YOU HAVE STUDIED AND UNDERSTAND THE LESSON ASSIGNMENT.

LESSON EXERCISES

REQUIREMENT: Exercises 1 through 5 are matching exercises. Column I lists types of food; column II lists the 3 general categories found on the pH scale. Select the area on the scale into which each food listed in column I would fall and indicate the answer on the answer form. Items in column II may be used once, more than once, or not at all.

Column I	Column II
1. Beef.	a. Acid.
2. Oranges.	b. Neutral.
3. Corn.	c. Alkaline.
4. Chicken.	
5. Potatoes.	

REQUIREMENT. Exercises 6 through 17 are true-false. Indicate the answer on the answer form by using A for TRUE and B for FALSE.

6. If five men from a 200-man company become ill after the entire company has eaten the same food, it would be considered a food poisoning outbreak.

7. Bacterial food poisoning is the easiest type of food poisoning to prevent.

8. The use of standard Army field equipment limits the possibility of metallic food poisoning.

9. Cooking pork at an internal temperature of 100°F kills trichina.

10. Bacteria and man live on the same food.

11. Most bacteria grow best in materials neither strongly alkaline nor strongly acid.

12. Bacteria will not grow in a moisture content of less than 15 percent.

13. Food toxins produce bacteria in food.

14. Staph food poisoning can occur when body tissues are invaded by bacteria.

15. Boiling food at 212° F for 30 minutes destroys toxins.

16. Salmonella multiply rapidly in an environment with high temperatures and no oxygen.

17. To prevent dysentery, messkits are sterilized by placing them in two different rinse waters which are kept boiling during use.

REQUIREMENT. Exercises 18 through 25 are matching exercises. Column I lists sources of food poisoning; column II lists the categories of food poisoning. Select the category of food poisoning in column II that describes each food poisoning source in column I. Indicate your answer on the answer form. The items in column II may be used once, more than once, or not at all.

Column I	Column II
18. Salmonella.	a. Chemical.
19. Lead.	b. Bacterial.
20. Trichina.	c. Plant.
21. Rodenticides.	d. Animal.
22. Staphylococus.	
23. Cadimium.	
24. Perfringens.	
25. Water hemlock.	

REQUIREMENT. Exercises 26 through 46 are multiple choice. Each exercise has only one single-best answer. Indicate your answer on the answer form.

26. What type of food poisoning is caused by the use of equipment that contains poisonous materials?

a. Biological.

b. Plants.

c. Bacterial.

d. Chemical.

27. Biological food poisoning is caused by all of the following EXCEPT

a. animals.

b. chemicals.

c. plants.

d. bacteria.

28. Galvanized metal containers may be used for storing

a. dry food.

b. liquid food.

c. dry and liquid food.

d. leftover meats.

29. If Army procured shellfish are improperly handled, what type of food poisoning is most likely to occur in the shellfish?

a. Animal.

b. Chemical.

c. Bacterial.

d. Plant.

30. Which of the following types of food poisoning is caused by pork infected by a microscopic worm?

a. Botulism.

b. Perfringens.

c. Salmonella.

d. Trichinosis.

31. All of the following factors influence bacteria growth **EXCEPT**

a. moisture.

b. space.

c. food.

d. time.

32. Bacteria must have moisture to live because it

a. allows them to absorb food through their cell walls.

b. provides them means of mobility.

c. provides oxygen.

d. keeps the temperature down.

33. During which stage of the bacteria growth cycle does the growth of new bacteria equal the death of old bacteria?

a. Lag phase.

b. Rapid-growth phase.

c. Equal phase.

d. Death phase.

34. If a jar of mayonnaise is left out of the refrigerator for 2 hours, how many more hours will it take for the bacteria to adjust to this new environment?

a. 1.

b. 2.

c. 3.

d. 4.

35. What type of food poisoning is most often fatal?

a. Botulism.

b. Strep.

c. Salmonella.

d. Staph.

36. A swollen container, discoloration of food, and a strong odor are indications of what type of food poisoning?

a. Metallic food poisoning.

b. Trichinosis.

c. Staph food poisoning.

d. Botulism.

37. Which of the following would most likely cause perfringens food poisoning?

a. Peas.

b. Apples.

c. Lettuce.

d. Pork chops.

38. All of the following are caused by bacterial toxins EXCEPT

a. botulism.

b. staph food poisoning.

c. salmonella.

d. perfringens.

39. Which of the following practices would be the best prevention for salmonella?

a. Cook food thoroughly.

b. Leave food at room temperature.

c. Avoid use of foods sprayed with insecticides.

d. Leave foods uncovered.

40. What type of food poisoning is a carrier illness or is spread by carriers of the bacteria?

a. Perfringens.

b. Salmonella.

c. Botulism.

d. Streptococcus.

41 The growth of salmonella can be prevented by

a. washing the food in warm water.

b. reheating food rapidly to 145° F.

c. keeping foods refrigerated.

d. sprinkling food with salt before storing.

42. Which of the following types of food poisoning is caused by a bacterial infection?

a. Botulism.

b. Staph food poisoning.

c. Perfringens.

d. Strep food poisoning.

43. In which of the following foods would strep organisms most likely NOT grow?

a. Ham.

b. Carrots.

c. Turkey dressing.

d. Cream cheese.

44. The least severe type of food poisoning is

a. botulism.

b. strep.

c. salmonella.

d. staph.

45. Which of the following is a food-borne illness?

a. Botulism.

b. Trichinosis.

c. Dysentery.

d. Perfringens.

46. What action should be taken before eating raw fruits in areas where dysentery is prevalent?

a. Wash fruit with cold water.

b. Peel the fruit; then immerse in 140 ^{o}F water.

c. Immerse fruit in prescribed chlorine solution for 30 minutes; then peel and wash.

d. Peel fruit; wash in water from approved source; immerse in water at 160 ^{o}F for 1 minute or immerse in prescribed chlorine solution for 30 minutes.

REQUIREMENT. Exercises 47 through 50 are matching exercises. Column I lists bacterial organisms which cause food poisoning; column II lists classifications of organisms according to their need or a lack of need of oxygen for existence. Select the term in column II which describes the bacteria in column I, and indicate your answer on the answer form. The terms listed in column II may be used once, more than once, or not at all.

COLUMN I	COLUMN II
47. Staphylococcus.	a. Anaerobe.
48. Botulism.	b. Aerobe.
49. Streptococcus.	
50. Salmonella.	

CUT ALONG THIS LINE

STUDENT EVALUATION OF SUBCOURSE

INSTRUCTIONS

1. Fill out this form and return it with your completed examination for this subcourse. If you have questions requiring a reply, use Student Inquiry Sheet (QMFL Form 101).
2. Print or type information in Section I.
3. Complete Sections II, III, and IV with SOFT LEAD PENCIL, if possible. Carefully consider each question and mark your choice of answer clearly in the appropriate column of the form. Your answers will assist the QM School in improving, revising, or rewriting the subcourse and therefore will be carefully evaluated.

I. GENERAL

Rep (C), Sep 75

Subcourse Number:	Title of Subcourse:	Date of Subcourse:
QM0348	PREVENTION OF FOOD POISONING	April 1971

Last Name	First Name	MI	Student Number:	Mil/Civ Grade:

Address (No., street, city and state)	Zip Code:

Education:	Grade School ☐	College	1 yr ☐	3 yr ☐	Post-College ☐
	High School ☐		2 yr ☐	4 yr ☐	

Occupation or Job Title:

II. SUBCOURSE TEXT MATERIAL If your answer is NO to any of the following questions, please explain briefly on the reverse side of this form.	Yes	No	Not Sure
1. Did the material provided in this subcourse enable you to meet the lesson objectives stated in each lesson assignment?	⁞⁞	⁞⁞	⁞⁞
2. Based on your own practical experience, did the procedures as presented in the text seem workable?	⁞⁞	⁞⁞	⁞⁞
3. Was the text material for each lesson assignment clear and understandable?	⁞⁞	⁞⁞	⁞⁞
4. Was all the detailed information (forms, examples, tabulated data, detailed procedures) included that you felt was needed for you to achieve the LESSON OBJECTIVES?	⁞⁞	⁞⁞	⁞⁞
III. SUBCOURSE LESSON AND EXAMINATION EXERCISES If your answer is YES to any of the following questions, please explain briefly on the reverse side of this form.			
5. Were there any lesson or examination exercises that were not applicable to the stated objectives?	⁞⁞	⁞⁞	⁞⁞
6. Were there any exercises for which you could not find a solution in the materials provided for this subcourse?	⁞⁞	⁞⁞	⁞⁞
7. After you had read the school solution and the references for each lesson exercise, did you find any exercises that still remained unclear or difficult to understand?	⁞⁞	⁞⁞	⁞⁞
8. Was there any information that needed to be added to the subcourse materials to make the exercises more understandable?	⁞⁞	⁞⁞	⁞⁞
IV. NEW COURSES OF INSTRUCTION If your answer is YES to the following question, please indicate the instructional areas required on the reverse side of this form.			
9. Are there any new courses of instruction that you feel are required for your professional development or for the development of greater proficiency in your field?	⁞⁞	⁞⁞	⁞⁞

QMFL Form 999-1
15 Mar 67

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CUT ALONG THIS LINE

STUDENT INQUIRY SHEET

Number/Title	Date
QM0348 Prevention of Food Poisoning	April 1971
	Reprint Rep (C), Sep 75

Use this form if you have a question or request for information concerning a subcourse lesson or examination. This form may be used to ask questions about lesson or examination exercises, but not to request solutions to those exercises. Use this form also for comments, suggestions, requests for additional subcourses, and other informal communications concerning your correspondence course enrollment.

Last Name	First Name	MI	Student Number/SSAN	Military Rank

Address (No., street, city and state)	Zip Code	Civilian Grade

If your name, grade, or address is new, please place an X in this box ☐	Date Submitted

Request information on or clarification of the following points:

The following errors have been found in the instructional materials:

106

(Additional space is available on the other side of this form.)

QMFL Form 101 Rev May 75	135-4601	Note. Fold this inquiry sheet with this School's address on the outside, staple or scotch tape it closed, and mail without an envelope.